



Company: NOBLE ENERGY
 Well: BERNHARDT J 31-20D
 API: 05-123-28163
 Rig Name: PRODUCTION/VES
 State/County: COLORADO/WELD
 Latitude: 40.355, Longitude: -104.830
 GRID North is 0.430 Degrees East of True North
 VS-Azi: 0.000 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : RKB = GROUND LEVEL

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: run01-de_01.ut
 Minimum Curvature Method
 Report Date/Time: 2/25/2013 / 10:55

VAUGHN ENERGY SERVICES
 HENDERSON, COLORADO
 866-835-8333
 NICK KULA

DEPTH REFERENCE=GROUND LEVEL

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	****
100.000	0.292	249.216	100.000	-0.090	-0.238	-0.090	0.255	249.216	0.292
200.000	0.337	257.595	199.998	-0.244	-0.764	-0.244	0.802	252.281	0.064
300.000	0.151	263.640	299.997	-0.322	-1.182	-0.322	1.225	254.767	0.188
400.000	0.314	260.237	399.996	-0.383	-1.583	-0.383	1.629	256.399	0.164
500.000	0.140	255.163	499.995	-0.461	-1.971	-0.461	2.024	256.844	0.176
600.000	0.149	263.531	599.995	-0.507	-2.218	-0.507	2.275	257.136	0.023
700.000	0.169	326.441	699.995	-0.398	-2.429	-0.398	2.462	260.688	0.167
800.000	0.764	22.553	799.991	0.341	-2.255	0.341	2.280	278.593	0.685
900.000	2.510	32.496	899.947	2.804	-0.822	2.804	2.922	343.653	1.762
1000.000	4.326	55.631	999.769	6.781	3.468	6.781	7.616	27.086	2.245
1100.000	5.844	57.743	1099.373	11.627	10.886	11.627	15.928	43.116	1.529
1200.000	8.167	58.322	1198.619	18.075	21.237	18.075	27.888	49.599	2.324
1300.000	10.273	54.475	1297.323	26.987	34.541	26.987	43.833	51.999	2.194
1400.000	12.805	50.245	1395.296	39.258	50.320	39.258	63.822	52.040	2.668
1500.000	13.183	47.959	1492.735	53.981	67.309	53.981	86.281	51.271	0.638
1600.000	13.541	46.700	1590.028	69.646	84.298	69.646	109.346	50.437	0.462
1700.000	14.112	47.028	1687.130	85.985	101.738	85.985	133.206	49.797	0.576
1800.000	13.736	43.540	1784.194	102.901	118.836	102.901	157.196	49.111	0.920
1900.000	13.159	54.562	1881.468	118.110	136.292	118.110	180.348	49.088	2.623
2000.000	13.712	52.400	1978.731	131.942	154.957	131.942	203.520	49.587	0.747
2100.000	14.007	52.724	2075.820	146.503	173.977	146.503	227.445	49.900	0.305
2200.000	14.138	55.159	2172.819	160.809	193.631	160.809	251.699	50.291	0.606
2300.000	13.380	50.289	2269.952	175.180	212.556	175.180	275.442	50.506	1.384
2400.000	12.215	47.712	2367.467	189.691	229.284	189.691	297.580	50.398	1.297
2500.000	11.817	53.157	2465.279	202.950	245.305	202.950	318.376	50.398	1.201
2600.000	11.514	51.741	2563.214	215.270	261.336	215.270	338.582	50.521	0.417
2700.000	12.225	52.806	2661.075	227.850	277.606	227.850	359.139	50.622	0.744
2800.000	12.898	52.848	2758.681	240.990	294.936	240.990	380.872	50.748	0.673
2900.000	12.660	53.490	2856.204	254.251	312.639	254.251	402.972	50.881	0.277

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
3000.000	11.032	55.496	2954.072	266.191	329.333	266.191	423.459	51.052	1.680
3100.000	11.132	52.581	3052.208	277.477	344.885	277.477	442.650	51.182	0.569
3200.000	10.712	50.522	3150.396	289.251	359.725	289.251	461.594	51.198	0.574
3300.000	11.037	51.895	3248.601	301.067	374.431	301.067	480.458	51.198	0.416
3400.000	11.453	49.340	3346.681	313.443	389.495	313.443	499.953	51.175	0.649
3500.000	10.291	44.437	3444.887	326.291	403.280	326.291	518.749	51.024	1.484
3600.000	10.925	48.764	3543.179	338.916	416.661	338.916	537.094	50.875	1.018
3700.000	11.360	48.290	3641.294	351.715	431.140	351.715	556.404	50.793	0.444
3800.000	12.310	48.030	3739.167	365.397	446.418	365.397	576.892	50.699	0.952
3900.000	13.864	52.023	3836.569	379.900	463.789	379.900	599.520	50.678	1.797
4000.000	13.425	52.739	3933.746	394.301	482.472	394.301	623.099	50.743	0.470
4100.000	14.306	52.215	4030.831	408.900	501.476	408.900	647.053	50.806	0.889
4200.000	13.520	52.006	4127.897	423.665	520.453	423.665	671.091	50.853	0.787
4300.000	13.266	58.480	4225.183	436.860	539.446	436.860	694.154	50.998	1.520
4400.000	13.823	57.842	4322.401	449.217	559.341	449.217	717.397	51.231	0.577
4500.000	14.312	53.798	4419.404	462.877	579.429	462.877	741.615	51.380	1.098
4600.000	14.672	56.396	4516.223	477.186	599.952	477.186	766.583	51.502	0.743
4700.000	15.206	57.369	4612.843	491.267	621.544	491.267	792.250	51.677	0.590
4800.000	14.692	57.244	4709.458	505.200	643.253	505.200	817.925	51.855	0.515
4900.000	14.475	58.702	4806.237	518.554	664.598	518.554	842.964	52.037	0.427
5000.000	13.811	56.676	4903.206	531.604	685.251	531.604	867.278	52.196	0.828
5100.000	11.984	56.304	5000.678	543.923	703.864	543.923	889.537	52.304	1.829
5200.000	9.552	55.500	5098.910	554.384	719.342	554.384	908.182	52.379	2.438
5300.000	6.603	51.987	5197.908	562.626	730.712	562.626	922.219	52.405	2.988
5400.000	5.046	45.340	5297.390	569.258	738.371	569.258	932.334	52.369	1.694
5500.000	3.292	39.485	5397.122	574.566	743.325	574.566	939.499	52.297	1.803
5600.000	1.398	27.599	5497.034	577.863	745.716	577.863	943.408	52.228	1.946
5700.000	1.125	295.767	5597.018	579.371	745.396	579.371	944.080	52.143	1.822
5800.000	0.846	235.504	5697.005	579.380	743.904	579.380	942.907	52.087	1.019
5900.000	0.400	88.937	5797.002	578.968	743.644	578.968	942.449	52.097	1.200
6000.000	0.356	137.210	5897.000	578.747	744.203	578.747	942.755	52.129	0.311
6100.000	0.143	109.213	5996.999	578.478	744.532	578.478	942.849	52.154	0.239
6200.000	0.261	51.895	6096.999	578.577	744.829	578.577	943.145	52.160	0.219
6300.000	0.532	18.029	6196.996	579.159	745.152	579.159	943.757	52.144	0.348
6400.000	0.572	14.383	6296.992	580.084	745.419	580.084	944.536	52.110	0.053
6500.000	0.805	11.591	6396.984	581.256	745.685	581.256	945.465	52.064	0.236
6600.000	0.977	16.074	6496.972	582.763	746.062	582.763	946.689	52.006	0.185
6700.000	0.694	4.397	6596.962	584.186	746.344	584.186	947.788	51.949	0.328
6800.000	0.590	342.226	6696.956	585.281	746.233	585.281	948.376	51.892	0.267
6900.000	0.700	357.214	6796.949	586.381	746.047	586.381	948.909	51.833	0.200
7000.000	0.850	8.240	6896.940	587.724	746.123	587.724	949.800	51.772	0.211
7100.000	1.011	14.335	6996.927	589.313	746.448	589.313	951.038	51.709	0.189
7200.000	1.365	21.836	7096.905	591.273	747.109	591.273	952.773	51.641	0.386
7300.000	1.558	13.149	7196.873	593.702	747.861	593.702	954.871	51.555	0.293
7400.000	1.610	24.987	7296.835	596.299	748.764	596.299	957.194	51.467	0.331

HORIZONTAL DISPLACEMENT IS
957.194 FEET AT 51.467 DEGREES